Commensuration and styles of reasoning:
Venice, cost-benefit, and the defence of place

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Abstract

This paper discusses some preconditions for "making things the same" by means of quantification and economic calculation. It examines a controversial cost-benefit analysis, conducted as part of the environmental appraisal of a large public sector project in Italy: the long-debated scheme for flood protection in Venice. By tracing the different "styles of calculation" that characterised the economic and environmental appraisal of the project, the paper analyses the inter-relationship between economic representations of the urban and natural environment, its political symbolism, and various attempts to intervene upon it. It follows how the objectivity of numbers is debated, stabilised or disrupted, as differing appeals to realism and accuracy are advanced in the context of different modes of intervention and practical aims. The paper shows that the "commensuration" and "standardisation" that numbers can bring about rest on how the object of calculation as well as, crucially, its subject are represented and conceived.

Keywords: commensuration, standardisation, objectivity, cost-benefit analysis, styles, calculation.

Introduction

Very large and visible projects such as the one considered here – the highly controversial system of mobile barriers for flood defence in Venice – give rise to epistemological wars as well as political ones. Disputes are inevitably mediated by expert knowledge seeking to produce "objective" representations in order to "tame" the conflicting subjectivities involved. Numbers, like the cost-benefit ratios examined in what follows, are turned to in attempts to "standardise" decisions (Rose, 1991; Porter, 1992). The resulting numbers can make decisions appear to descend from a neutral, impersonal and calculative logic, rather than from subjective judgement. Numbers provide a sort of "metacode", a "universal code that appears to be comprehensible in all frames of reference" (Rottenburg, 2009, p. xxix). Once backed up by calculation, decisions are perceived as replicable and independent of the people taking them. The subject of the decision is thus "standardised", made impersonal. And so is its object: numbers represent reality in a universal format which allows it to circulate and be further calculated and formatted. Through numbers, specific places are turned into abstract calculable spaces, which can be compared, ranked, variously organised and governed "from a distance" (Latour, 1987; Miller, 1992; Robson, 1992; Rose & Miller, 1992; Preston, 2006).

Yet the extent to which numbers can objectify and standardise the world, the degree to which calculative tools can achieve authority, and the more general roles of accounting and economic calculation in mediating certain modes of governance are things that shift over time and across institutional domains (Burchell *et al.*, 1985; Hopwood, 1987, 1992; Miller & Napier, 1993; Porter, 1995b; Miller, 1998). Porter speaks of "information cultures" to indicate that the prevalence of quantification in government has to be analysed in relation to the specific values and aspirations attached to numbers and quantitative methods, and that these should not be presupposed as universal or invariant (Porter, 1995a). Along similar lines, Power observes that forms of economic calculation can emerge in relation to a variety of "problems of objectivity" which do not univocally correspond to a given, monolithic and overbearing market culture or scientistic culture (Power, 1996).

Despite recognising that accounting's role in socio-economic governance is a contingent and shifting phenomenon, research has not yet paid systematic attention to this variability. As recently noted, research in the field of social and institutional accounting studies has not yet "come up with sustained investigations exploring […] interrelations between theories and models of accounting and finance, the enactment of those relations, and their formation and reformation, in diverse settings and cultures of calculation" (Vollmer *et al.*, 2009, p. 627).

Accounting and economic calculation have been described as being at the core of a process of cultural rationalisation happening at world level (Meyer, 1986b; Meyer *et al.*, 1997; Drori *et al.*, 2006). Yet, despite the universalistic ambition of such cultural rationalisation, it is not replicated uniformly and universally (Czarniawska & Sevón, 1996; Cooper *et al.*, 1998; Lounsbury, 2008; Mennicken, 2008). This is so not only because different local traditions exist and persist, but also because such cultural rationalisation is anything but a monolithic and invariant process. Rather, it is a phenomenon whose generality, and the very conditions for such generality, need to be reconstructed by investigating it in its articulation and internal variety. Even if quantification and economic calculation tend to be appealed to (or resisted) everywhere in the name of values such as transparency, democracy, objectivity, scientificity, or rationality, the ways in which such values are interpreted and conveyed through numbers are contingent and context-specific (Fourcade, 2011). Such contingency and specificity need to be addressed if one is to reconstruct the conditions underlying the rise and spread of accounting and economic calculation. Exploring variations on the theme of how accounting and economic calculation become models of governance and organisation is crucial in order to understand the sources of their authority and appeal. One can thus "begin to explore the different ways in which accounting invents calculating selves and calculable spaces" (Miller, 1992, p. 64), including those situations in which such "invention" is resisted, counteracted and displaced (Espeland, 1998, p. 37).

This paper seeks to contribute to such agenda. It examines the conflicting approaches to the costing of flood damages which characterised the cost-benefit analysis of the flood protection scheme for Venice. The case-study provides the opportunity to analyse different calculative rationales as they emerge and clash, as well as the conditions for their emergence. It is a study of variability, in at least two senses. First, it is a study of how a supposedly standard calculative approach like cost-benefit analysis was followed in a specific territory and within specific discursive conditions which counteracted the commensuration and objectification which the technique was supposed to bring about. Second, it is a study of the encounter of different calculative rationales, of what happens at the crossroads of multiple "accountings" and calculative approaches when they are confronted with each other. As such, this paper re-examines the relationship between economic calculation and processes of standardisation and commensuration.

Porter's work has addressed the relationship between quantification, objectivity and standardisation (Porter, 1992, 1995b, 1996). Porter links the rise of calculative tools like cost-

benefit analysis to situations in which professional expertise is permeable to the questioning of challenging outsiders, when decisions must be defended by appealing to neutral and impersonal criteria rather than to subjective judgement and experience. The objectivity of numbers is equated with standardisation, a process whereby decisions are linked to replicable calculative methodologies which are seen to transcend individual subjectivity and deemed universally applicable (Porter, 1992). In this sense, numbers can support the aspiration to "escape from perspective" (Daston, 1992) and obtain a univocal, impersonal interpretation of the phenomena around which decisions come to be framed. They can become powerful symbols of social order – a precondition, rather than a consequence, for them standing also as symbols of truth. Seen as independent of individual perceptions and idiosyncratic interpretations and as "the bedrock of systematic knowledge", "numbers have come to epitomize the modern fact" (Poovey, 1998, p. xii).

Espeland and Stevens use the notion of commensuration to indicate a specific form of standardisation, one that occurs through numbers as distinct from qualitative classes or categories. Commensuration is seen as the process whereby different qualities are measured with a single standard or unit, to derive a common metric through a series of aggregations (Espeland, 1998, p. 24; Espeland & Stevens, 1998; Espeland, 2000). Through commensuration, "everyday experience, practical reasoning, and empathetic identification become an increasingly irrelevant basis for judgment as context is stripped away ad relationships become more abstractly represented by numbers" (Espeland, 1998, p. 25). In this way, Espeland notes, new links are forged between things previously separated, but at the same time distance is created by the mediation and abstraction imposed by numbers (1998, p. 28). New standardised objects – the aggregates constituted in the act of commensurating – are formed, and the meaning and value of the individual elements thus aggregated changes as a result. Commensuration "changes the locus and form of attention, both creating and obscuring relations among entities" (Espeland & Sauder, 2007, p. 16). Espeland and Stevens, like Porter, link commensuration to cultures which oppose "personal ties, elites or patriarchal relations" (1998, p. 321). Commensuration is seen as a way to reform institutional systems based on personal relationships and local knowledge in the name of impersonality and universality. Commensuration is linked to the pursuit of a "common interest" (Huault & Rainelli-Weiss, 2011).

Espeland and Stevens (1998) draw attention to some of the conditions underlying resistance to commensuration and claims of incommensurability. "Incommensurables" are seen as likely

to emerge at the margin between different institutional domains, where values and identities are in question. The two authors call for a more systematic investigation of commensuration and its limits across different institutional contexts: "We need to explain variation in what motivates people to commensurate, the forms they use to do so, commensuration's practical and political effects, and how people resist commensuration" (Espeland & Stevens, 1998, p. 315). Huault and Rainelli-Weiss (2011) discuss the importance of cognitive differences in explaining failed attempts to commensurate. Drawing on the sociology of worth (Boltanski & Thévenot, 2006), they trace the different "orders of worth" underlying attempts to compromise between different risk metrics in the market for weather derivatives.

In the project appraisal analysed here, different approaches to the costing of flood damages emerged, reflecting different understandings of "objectivity" and varying degrees of belief in the possibility to "commensurate" and in the validity of the aggregate measures resulting from commensuration. Different numbers resulted from different ways of conceiving how the territory should be represented and inscribed in cost-benefit calculations. They offered different ways of understanding and "rendering visible" (Miller, 1990) the specific territory constituted by Venice and its lagoon – the object of calculation – and articulated different possibilities for intervening upon it. Borrowing from Jasanoff (2005), these different rationales and modes of representation will be described as: a "view from nowhere", seeking to establish a universal and impersonal way to calculate costs and benefits; a "view from somewhere", based on local knowledge and experience; and a "view from everywhere", which tried to compromise between the latter and the former.

Following the history of science and statistics (Hacking, 2002; Schweber, 2006), the notion of "style" is proposed here to characterise these different calculative approaches. Hacking introduced the notion of "style of scientific reasoning" as part of a historical epistemology that seeks to investigate the conditions for the emergence of specific ways of knowing. Styles of reasoning are defined as the ways in which the possibility for truth and falsehood, and thus the contents of a certain body of knowledge, are constituted. The existence of various styles of reasoning does not imply, according to Hacking, that what is true under a certain style will necessarily be false under another. Rather, it simply implies that truth values can be established only by virtue of a certain style within which specific possibilities for truth and falsehood are created and others are excluded, and which thus "determine what counts as objectivity" (2002, pp. 160-161). Styles of reasoning settle the types of investigations through which certain notions of objectivity can be pursued.

The notion of "styles of calculation" is used here to highlight that differences in modes of economic calculation can be analysed in terms of the styles of reasoning underlying them. Tracing such styles, attending to the specific notions of objectivity they endorse, and examining the different possibilities they open up for representing a territory and its economy and for intervening upon them, helps us to make sense of the encounter and potential clash of different calculative approaches, such as those at play in the cost-benefit analysis studied here.

Hacking's notion of styles does not transplant unproblematically to a public controversy like the one analysed here. Making it relevant for this study implies moving away from a historical epistemology that spans the whole history of science to address a specific controversy over the local application of a specific calculative approach – cost-benefit analysis – rather than examining the formation of altogether different bodies of knowledge and their conditions of emergence. None the less, the notion of style is considered helpful in at least two respects. First, it enables us to unpack the terms of the dispute beyond the mere identification of the conflicting interests at stake, of its winners and losers. It helps to trace the various rationales that those interests expressed, and which may have contributed to the formation of those interests in the first place. Disputes like the one analysed here are at once scientific and political, they testify to the impossibility of conceiving science and politics as autonomous domains. The conflicting calculations at play reflected both different ways of reasoning about the territory which encompassed deep-rooted cultural values, and explicit attempts to further or oppose specific projects and agendas for action. The sort of defence of place which sought to oppose the attempt to inscribe the territory in an ultimate cost-benefit ratio, this paper argues, was both symbolic and strategic, driven by beliefs and values as much as by an explicit attempt to counteract certain governmental interventions. Tracing different styles of reasoning behind conflicting numbers does not mean that an epistemological explanation of a controversy is favoured at the expense of a political-economic one. The notion of style simply enables us to see power and knowledge as mutually constitutive. It assumes neither that numbers are utterly biased and manipulated by prior interests which would exist independently of any knowledge of the problems at play, nor that economic stakes, political passions and cultural values are unable to permeate and shape knowledge production.

Second, Hacking's notion of styles enables us to move beyond a rigid dualism between commensuration and claims to incommensurability, between colonising numbers and

indigenous resistance to calculation. Public disputes involving contested expert evidence display more complexity than is conveyed by these alternatives; they exhibit the emergence of multiple ways of "making things the same" by means of economic calculation and display varying degrees of resistance to commensuration. Such disputes reflect not so much the encounter between a standardising and commensurating (western) rationality and a pristine "other" not yet colonised by calculation, such that one or the other will prevail; more often, they represent the very ways in which such rationality is continuously deconstructed and reconstructed from within (Meyer, 1986a).

The rest of this paper is organised as follows. After a short description of the research materials used, the paper provides an overview of the so-called "safeguard" of Venice and of the flood protection scheme for the city. The second part of the paper illustrates the appraisal of the scheme and the conflicting positions taken by its supporters – the Ministry for Public Works, its local branch the Water Magistrate, and the consortium of firms in charge of designing and building the project (the Consorzio Venezia Nuova) – and its opponents – the National Commission for Environmental Impact Assessment, the Municipality of Venice, and several civil society organisations (see figure 1). The third part of the paper traces the different "styles of reasoning" underlying the arguments and calculations offered by these different actors, and the different understandings of the object of calculation (Venice and its lagoon) they entailed. These different styles were never reconciled. The flood protection scheme for Venice was ultimately approved but its costs, benefits and environmental impacts were never agreed upon. As a decision rule to "tame" political conflict, as a way to seek impersonality and standardise the decision and its subject, cost-benefit analysis was ultimately defeated. The fourth section of the paper argues that such defeat was less the result of irreconcilable differences in styles of calculation and more the outcome of a specific way of conceptualising the subject of the decision – the state itself. The concluding section discusses the implications of the case for our understanding of the role of accounting and economic calculation as technologies that produce objectivity, commensuration and standardisation, and of the conditions and limits for the latter.

Figure 1: The appraisal process

[insert Figure 1 here]

Note on methodology and materials

The materials used in this article consist of official documents collected between 2003 and 2008. These documents date from the early 1980s to the late 1990s, but a larger set was analysed in the course of this research project. Empirical work was placed at a meta-organisational level to reconstruct how calculations were represented, problematised or invoked by a variety of actors at a variety of sites. Forty-two interviews were conducted within different organisations variously involved in studying or assessing the flood protection scheme for Venice or related issues, in most cases prior to obtaining access to the cited documents.

Given that it was conducted several years after the appraisal process examined here took place, this research was not intended as a direct observation of calculations "in the making", in the specific locations and at the specific times in which these were carried out. What is being analysed here is the discourse *over* calculation that emerged in the course of the controversy: how calculations ought to be and what they set out to achieve, according to the official reconstructions offered by the organisations involved.

Official documents usually offer quite abstract, "rationalised" and functionalist understandings of what calculation should achieve and tend to disregard its practical applications. The sources analysed here tend to differ. They were produced for the national government in the course of an open controversy and are thus rich in detailed observations and critical comments on the calculations provided by others. Far from offering a standard account of economic calculation, they help to trace the different types of investigations pursued through the same project appraisal and the different modes of representation fostered by the same set of calculations.

The safeguard of Venice

The set of scientific debates and public projects denoted today as the "safeguard" of Venice can be traced back to November 1966, when an exceptional high tide submerged the city causing the worst flood known in its history. The disaster helped to realise that the lagoon surrounding Venice had lost much of its natural resilience to floods, due, *inter alia*, to the industrial developments around the port of Venice which began in the 1920s (Fletcher & Da Mosto, 2004; Fletcher & Spencer, 2005). The 1966 flood was followed by intense debates in the national and international media, within the scientific community, supranational

organisations like the UNESCO, civil society organisations and the national parliament (UNESCO, 1969; ANSA, 1996).

Since 1973, when Venice was declared a matter of "prior national interest" (law no. 171/1973), flood protection and the restoration of the hydro-morphological equilibrium of the Venice lagoon have been under the responsibility of the Ministry of Public Works, whereas the urban and architectural maintenance of the city have remained largely under the responsibility of the Municipality of Venice. In 1984, a new "special law" for Venice (no. 798/1984) specified how the interventions under the responsibility of the national government were to be realised: through the appointment of a private *concessionaire*, which was later identified in the Consorzio Venezia Nuova (CVN from now on). This is a consortium of large engineering and construction companies and smaller local cooperatives (see appendix). This decision proved very controversial, as CVN was appointed without a public tender and became the sole concessionaire of the Ministry for Public Works and of its local branch, the Venice Water Magistrate. To counterbalance the large powers attributed to the concessionaire, the law tried to ensure its effective monitoring and oversight by creating within the national government a special "Committee for Policy Coordination and Control". This inter-ministerial committee is in charge of high level political supervision on all matters concerning Venice and its safeguard, for which it is the ultimate decision maker (see appendix). The monopolistic position of the CVN has not ceased to stir discontent and fierce criticism, and has been the object of an appeal to the European Union (see appendix).

Among the interventions which in 1973 were placed within the remit of the national government was the realisation of a flood barrier, whose design was developed by the National Research Council in the course of the 1970s, and assigned to the CVN after the passing of the aforementioned law 798/1984. The original project idea was partly altered and redeveloped by the CVN in the course of the 1980s and 1990s, leading to the present version of the project: a set of mobile barriers to be placed at the three lagoon inlets and to be operated in case of exceptional high tides. The barrier is made of 78 retracting oscillating buoyancy steel gates distributed across the three inlets. Under normal conditions, gates are filled with water and rest on concrete caissons implanted on the sea bed at the inlets. To be operated, they are inflated with compressed air, which makes them rise and oscillate around their hinge, so as to temporarily separate the lagoon from the sea. The project is known as Mo.S.E., the acronym of the barrier prototype realised in the 1980s, which came to be used to denote the barrier itself.

The barrier is not the only flood protection initiative established by the special laws for Venice. Other, "softer" measures have been adopted. A first set of measures concerns the morphological restoration of the lagoon to contrast erosion and support the natural resilience provided by salt marshes. Such restoration works are known as "diffuse measures", and are under the responsibility of the national government (and thus of the Water Magistrate and CVN). A second set of measures, known as "local defences", entails the restoration and maintenance of the built environment, including the raising of pavements and embankments and the periodic dredging of canals in the city. Some local defences (e.g. in the area of Saint Mark) have been realised by the CVN until the mid-1990s, when, following law 139/1992, works were assigned to the Municipality as part of a major set of urban maintenance and restoration initiatives. Insula Spa, a public limited company controlled by the Municipality, was founded in 1997 to undertake them (see appendix).

These different sets of projects were always conceived by the law as complementary. However, environmentalists and other actors, including the Municipality of Venice, have always regarded the full restoration of the lagoon as a precondition for the construction of a flood barrier. Furthermore, they saw the consequences of a partial or temporary closure of the lagoon inlets on the hydraulic, morphological and environmental conditions of the lagoon as highly uncertain. The priority was to restore the natural resilience of the lagoon and to "undo" the damages caused by decades of industrialisation. That the exchange of waters between the lagoon and the sea, which had for centuries remained more or less "natural", had to be delegated to a complex artificial system was considered problematic. Since 1975, governmental guidelines had established that any flood barrier would have to be gradual, flexible and reversible, so as to experiment *in vivo* how the lagoon reacted to the closure of the inlets. These three conditions have been strongly endorsed by the Municipality (Consiglio Comunale di Venezia, 1979, p. 1/2), and have been seen to reflect the traditional prudence with respect to hydraulic works for which the old Republic of Venice is still praised today. The degree to which the Mo.S.E. project fulfils such conditions has been and remains very controversial. First, the concrete caissons on which each gate rests are not removable. Second, the barrier will fix the size of the lagoon inlets at their present artificial depth and width. As a result, the barrier will make permanent several changes to the lagoon morphology – such as the size and depth of the channels at the three inlets – brought in by the needs of navigation associated with the industrial and commercial development of the port of Venice.

In the course of the last thirty years concerns with the barriers' cost, complexity and potential interferences with the lagoon's economy, ecology and morphology have repeatedly been voiced by the city council in Venice as well as by individual experts, environmental and conservation groups and other civil society organisations. Those matters of concern have been at the centre of the scientific and political controversy which sparked on the occasion of the environmental impact assessment and cost-benefit analysis of the project, to which we now turn.

The appraisal of the flood protection scheme

The cost-benefit analysis examined here was conducted as part of the environmental impact assessment (EIA) of the flood protection scheme. EIA was introduced in the European Union in 1985 by Directive No. 337, which made such assessments compulsory for some specific categories of projects. The Directive was transposed into Italian law in 1988.[1] However, it was not until 1995 that the Committee for Policy Coordination and Control agreed to subject the project to an EIA.[2] Requests for such an appraisal had been advanced by the Municipality of Venice since the early 1980s, before the issuing of Directive No. 337.

In 1982 the city council had passed a motion inviting the executive committee [*giunta*] to (Consiglio Comunale di Venezia, 1988, p. 2):

> […] promote, together with the relevant Ministries, the conduct of a cost-benefit analysis relative to the entire set of interventions in the lagoon, to be completed with the utmost solicitude, based on the criteria provided by modern environmental economics, and on the principles which have inspired the special law [for Venice].[3]

In this document, "modern environmental economics" was seen as a tool for coordinating and systematising a set of complex projects spanning across levels of government. It was demanded to make visible potential trade-offs among projects, to set priorities, and to make interventions comparable so as to organise and rationalise them. It was, in short, appealed to as a tool for the commensuration and rationalisation of different projects across different levels of government.

In 1985 the city council explicitly requested an EIA for the mobile barriers, to be "elaborated with special care" (Consiglio Comunale di Venezia, 1985, p. 2). In 1988 the city council

[1] With Decree of the President of the Council of Ministers of 10 August 1988, no. 377 and of 27 December 1988; the latter has been updated by Decree of the President of the Republic no. 348 of 2 September 1999.

[2] The flood protection scheme for Venice did not neatly fit into any of the project categories mentioned by the Directive and by subsequent national legislation, and whether an EIA was to be seen as compulsory or not remained controversial for quite some time.

[3] All translations from documents in Italian are the author's own.

raised the problem of "technical-scientific control" over the projects developed by the CVN, including the mobile barriers. The city council noted that (Consiglio Comunale di Venezia, 1988, p. 2):

> The shift to the executive design phase for the more relevant interventions assigned to the Consorzio Venezia Nuova makes the choice of a more adequate system of technical-scientific control on the project solutions [proposed] by the concessionaire no longer deferrable.

At this stage, requests for an environmental and economic assessment expressed the preoccupation to gain a second opinion on the technical solutions developed by the CVN, and on the mobile barriers in particular. A concern with economic efficiency and technical effectiveness repeatedly emerged (Consiglio Comunale di Venezia, 1995a, p. 3/10):

> The environmental, landscape and functional compatibility and suitability of any project aiming at making artificial, by means of complex systems, the management of internal water flows and the defence from medium-high tides should be carefully verified, and not only with respect to a cost-benefit analysis, but also and above all in terms of ensuring that the intended results will be achieved.

By 1995, the environmental and economic appraisal of the mobile barriers had come to be seen as "indispensable … to express an opinion and make a decision" (Consiglio Comunale di Venezia, 1995b). The city council once more recommended to conduct a cost-benefit analysis of the project, where costs and benefits had to be "understood broadly, not only in a strictly economic sense" (Consiglio Comunale di Venezia, 1995a, p.10/10).

In the same year, the council also clarified what was expected from the environmental appraisal (Consiglio Comunale di Venezia, 1995a, pp. 8-9/10):

> The city council believes that the environmental impact assessment should be conducted […] by one or more actors able to provide the greatest guarantees of professional competence and knowledge of the specific situation of the lagoon, as well as independent judgement. [...]
> It thus believes that in order to undertake the EIA the contribution of those international institutions best able to guarantee impartial work (UNESCO, scientific bodies of the European Union, scientists of worldwide standing) should be sought, together with extremely qualified local and national contributions.
> In the council's opinion, it is crucial that the detailed procedures to follow in the EIA, where such procedures should necessarily take into account the great specificity of the lagoon environment, should be defined by a Scientific Committee comprising experts of great standing, which should ensure the accurate choice of the parameters on which the EIA is to be based, the definition of the procedures it should follow [*iter procedurale*], as well as the control over its advancement and the evaluation of its results.
> The council believes that […] public consultation should subsequently be sought, in order to involve citizens and local institutions in a decision of such relevance, and to restore transparency and democratic participation.

The council was referring to a theme which has been running throughout the entire history of the safeguard of Venice: the uniqueness and specificity of this territory. As will be shown later, such claims of specificity worked against the standardisation that the very appraisal invoked here was going to require. The quote above also reinforces the sense that the EIA was

demanded by the Municipality in order to open the decision making process to independent scrutiny. The strong emphasis placed on impartiality, independence, competence and transparency suggests that the appraisal was seen as a way to introduce more "checks and balances" in the appraisal process. These additional checks and balances were to include local "lay" participants and professional experts who were to be, in part at least, international. International institutions were seen as guarantors of impartiality.

The local and the international were being jointly mobilised in order to counterbalance the national government and its experts. Calculative authority for the appraisal of the project was to be polycentric and multi-level. Such "polycentrism" was officially endorsed by the national government when the EIA procedure was finally agreed. Italian legislation prescribes for EIAs the following procedure: an environmental impact study (EIS) is produced by the proponents of the project (in this case the Ministry for Public Works through the Water Magistrate and its concessionaire CVN); such study is then subjected to public consultation and finally reviewed by the National Commission for EIA (part of the Ministry for the Environment). The Commission provides a final opinion on the environmental impact of the project, which is followed by a decree of environmental compatibility issued by the Minister for the Environment. An exceptional element was added in the case of Venice, to meet the request advanced by the Municipality: a panel of five experts of "proven international standing" was appointed to review the EIS (see appendix). In addition, in 1995 the Committee for Policy Coordination and Control asked the Municipality to gather information concerning the "organisation of the city", which the Municipality had privileged access to, based on which the "risks facing Venice" could be assessed. It was believed that such information, issued in 1996, would be useful for the redaction of the EIS. Hence, the Municipality was given an official opportunity to provide an input to the EIA of the mobile barriers (see figure 1 above).

While the CVN, the Water Magistrate and the panel of international experts believed that the project passed the test of EIA and cost-benefit analysis, the National Commission for EIA and the Municipality of Venice expressed a strongly negative opinion on the barriers, both on environmental and economic grounds. The national government was thus left with two discordant opinions. Following the negative opinion of the National Commission for EIA, a decree of negative environmental impact was issued by the Ministry of the Environment (jointly with the Minister of Cultural Heritage). However, the decree was appealed in 1999 by the Regional Government and several business associations, and in 2000 a sentence of the

Regional Administrative Court [*Tribunale Amministrativo Regionale*] invalidated it.[4] This opened the path to the ultimate, but still fiercely controversial, approval of the project in 2001.

The Water Magistrate and the Consorzio Venezia Nuova

The EIS included a cost-benefit analysis conducted on three project alternatives: option zero ("do nothing"), the mobile barriers as designed by CVN, and a third option constituted by the combination of local defences and diffuse measures. These three "options" were not seen as mutually exclusive; they were all part of the general plan of interventions for Venice and its lagoon proposed by the CVN since the mid-eighties. Treating them as alternatives in the cost-benefit analysis was a way to find out whether local defences and diffuse measures, individually or in combination, would be sufficient to gain the desired level of safety for the city at an acceptable cost, or whether the mobile barriers were indeed necessary.

The socio-economic effects of the mobile barriers were addressed in the EIS in relation to three sub-systems: fishing and aquaculture, port activities, manufacturing activities and services. The aim was to calculate the net present value of the costs that the project would allow to avoid in the short and long run, together with any damages it could cause to local economic activities, in order to get to a measure of the net benefits of the project. Calculations were based on three main scenarios: no sea level rise, sea level rise of 10 cm, sea level rise of 20 cm.[5] The main interferences regarded the functionality of the port of Venice during the construction and operation of the barriers, which, in all three scenarios, were deemed to be "within acceptable limits" (Magistrato alle Acque Venezia & Consorzio Venezia Nuova, 1997, p. 157). The economic benefits of the mobile barriers were calculated as total avoided costs (long-term and short-term) less total interferences on port activities, discounted at a 5% rate.

The panel of international experts

The review of the EIS made by the five international experts generally endorsed the mobile barriers from an engineering and environmental perspective, though making some strong

[4] The decree was invalidated largely for procedural reasons. The Ministry for Cultural Heritage had signed the decree against the positive opinion on the project previously expressed by its technical office. This, according to the Court, would have been acceptable only if the Minister had explained and motivated this discrepancy. Secondly, the Court found that the review of the EIS conducted by the national commission for EIA contradicted the special legislation for Venice or tried to interpret it in a way which was unfavourable to the mobile barrier project, whereas the latter, or at least some form of the latter, had itself been prescribed by the law.

[5] These thresholds were subsequently revised in the light of more updated estimates of sea level rise provided by the Intergovernmental Panel on Climate Change, but, according to some, not to a sufficient extent (Pirazzoli & Umgiesser, 2003, 2006).

recommendations for further tests and studies as well as some changes to the design of the project. A substantial part of their report was devoted to the cost-benefit analysis of the mobile barriers. The report concluded that the project passed "the test of cost-benefit analysis" (Bourdeau *et al.*, 1998, p. 38). However, it observed that only a "partial" cost-benefit analysis had been possible, either due to incomplete data (for example related to damages to port activities) or to the impossibility to quantify the value of the city's artistic and historical heritage. Despite these disclaimers, the five international experts concluded "that useful and operational conclusions can be derived from the analysis of the available quantitative estimates" (1998, pp. 35-36). The study concluded that: "The procedure used in the EIS to calculate long-term damage is considered acceptable" (1998, p. 43).[6] The project was seen to be able to reduce between 85% and 90% of the costs of repairing flood damages.

The cost of local defences and the effectiveness of diffuse measures were one of the most controversial aspects of the EIS. The net present value of the combination of the two was found to be negative under all three scenarios. At the time the report was written the Municipality was asking to explore the feasibility of raising the pavements of the lower parts of the city to +110 cm or even, when possible, +120 cm (so-called "augmented" local defences). The international experts, while using these new levels in their analysis, did not engage with the views expressed by the Municipality on what the cost for such augmented local defences would be, and tended to accept estimates provided by the CVN and "confirmed by other interviewees" (1998, pp. 44-45), assuming that such a project would affect 40% of the surface of Venice, require ninety years for completion and cost 4,200 billion Lire. In addition, the augmented local defences were seen to have social and psychological costs non quantifiable in cost-benefit terms, while the mobile barriers were seen to bring intangible social benefits, broadly identified with the high degree of safety and protection from floods.

The nature of Venice and its lagoon as "an international public good which must be preserved not only in the interest of Venetians but also of mankind as a whole" was especially underlined by the international experts (Bourdeau et al., 1998, p. 11). Costs were defined at the most abstract level possible: for mankind as a whole, including future generations. The

[6] Long-term costs were defined as costs associated with the accumulation of damages from multiple tidal events, whereas short-term costs were those due to the impact of a single high water. Damages to the physical infrastructure of the city due to the recurrence of floods overtime belonged to the first category: erosion of the shoreline, damages to canal walls and embankments and to buildings facing canals due to the low waters which follow floods, salt aggression to buildings, and damages to the drainage system. Economic losses due to disruptions to traffic and business activities, and damages to goods stored on ground floors, belonged to the second category.

intangible and non-monetary benefits of the barriers, like the value of preserving Venice's heritage to future generations, of avoiding the social costs of local defences, and of keeping the city "dry" and safe, were especially emphasised.

The working group of Venice Municipality

In 1996 a working group appointed by the mayor of Venice analysed the impact of high waters both on the physical structure of the city and on its economy. The stated aim of the study was not to precisely quantify flood damages, but to collect all the qualitative and quantitative information which the local administration had access to, in order to "provide a general framework and basic parameters" (Comune di Venezia, 1996, p. 30/145) to be later examined and further developed in the course of the EIA.

While the authors of the EIS and the five international experts were concerned with the possible underestimation of flood damages, the working group warned against the risk of overestimating the socio-economic impacts of high waters. The working group regarded the data employed in its study as "reliable", but, as its report warned, it had been elaborated assuming the more pessimistic scenarios. It had been deemed: "important, first of all, to define the maximum value of such impacts" (1996, p. 7/145). The working group saw its calculations as open-ended: "information is displayed in such a way to allow for any further evaluation exercise" (p. 7/145). They claimed to be presenting reliable, if "raw", data.

The results of the estimation exercise were interpreted in the light of actual, but incomplete, information about the distribution of the population on ground floors. As a way to test results against some real benchmark, the high tide of October, 5 1992 (+124 cm), whose effects had been described in the main local newspaper, was taken as a reference point. The impact of high waters as documented by the local press was seen as less costly than the estimation exercise would suggest, because, it was claimed, over time people working and living in Venice have learnt various resilience strategies.[7]

The importance of considering "historical experience" as opposed to the "hypothetical results" obtained through modelling was often stated, suggesting that the former was seen as a preferable, more reliable source of evidence. The actual damages caused by a severe flood in 1986 (+158 cm) were seen as much smaller than those predicted by the working group for

[7] These were listed in the report: applying removable barriers to the front doors of houses, raising of the level at which wires and electric boxes are placed, storing stocks and valuable materials above +120 cm. In addition to these private measures, raised wooden walkways for a total length of 4 Km are placed by the Municipality on the main pedestrian routes in the city.

tides of +140 cm, a reason to take these predictions "with extreme caution". The working group relied on historical evidence which was more qualitative than quantitative, assumed to capture "the real experience of the city" in a way that probabilistic models could not.

After the publication of the EIS in 1997, the Municipality produced a second report with the opinion of its working group on the EIS, followed in 1998 by a third report with its opinion on the report by the five international experts. Both documents were quite critical. The calculations contained in the EIS were questioned, on several grounds. In many cases, the costs avoided with the mobile barriers were deemed overestimated. Many maintenance costs assumed to be avoidable once the mobile barriers would be in place were seen by the Municipality as non-differential to the decision to construct the barriers. This was the case, for example, of the maintenance and repair of embankments and buildings facing canals due to the effect of "low waters",[8] and of damages to buildings from salt aggression. Damages were related to causes other than low waters (e.g. motorboat wake) which would not be removed by the mobile barriers. According to the Municipality, maintenance costs could not be much reduced if the mobile barriers were built, and thus the greatest part of such costs should not be credited as a benefit of the mobile barriers. Damages to buildings due to salt aggression were also seen as largely non differential. Such damages were seen as inevitable, part of the ordinary life of the city. In these debates, what counted as "ordinary" and unavoidable maintenance – due to the simple fact that the city is built on water – as opposed to the "extraordinary" costs due to exceptional high waters, remained ambiguous.

In other cases, the calculation of flood damages in the EIS was seen to descend from the generalisation of non-representative samples. This was the case of damages produced by "low waters" to embankments and buildings facing canals,[9] or damages caused by floods to the drainage system.[10] For both sets of damages, the extension to the entire city of costs incurred

[8] With every flood aquifers tend to be permeated by salt water and their level increases, reaching close to the surface. If the tide withdraws too rapidly, walls and embankments are subject to a rapid change of pressure between the still full aquifer and the withdrawing tide. This can result in instability for the built environment facing canals.

[9] The authors of the EIS had estimated damages by monitoring some embankments in the Pellestrina littoral, and reckoned that in the overall lagoon about 46 Km of embankments were at risk from low waters. However, the working group did not consider Pellestrina as a representative sample of the 46 Km at risk (Comune di Venezia, 1997).

[10] When the EIS was elaborated, sewer ducts had undergone repair works in two areas (St. Mark's square and the Tolentini area). The average cost per metre of repairs incurred in the two areas was chosen to calculate the cost for similar works throughout the whole city. Like in the case of embankments, the working group contested the sampling methodology used in the EIS observing that works in the St. Mark area are much more expensive than anywhere else in Venice. Furthermore, it observed that at +100 cm, which corresponds to the level at which the

for the maintenance and repair of individual areas was contested, because such areas were not considered representative of the whole, either in physical terms (actual damages suffered) or in economic terms (for example, repair works in the area of St. Mark costing more than elsewhere).

The same problem of non-representative sampling was identified for the calculation of damages to socio-economic activities. The working group of the Municipality was especially critical of this part of the EIS, which did not fully use the information collected in the 1996 study, and especially the historical distribution of tides in the course of the day and their permanence at each tidal level. Such statistical data were deemed fundamental precisely because they were "historical", "real", as opposed to the more abstract and undifferentiated scenarios made in the EIS (1997, p. 38/43):

> By not taking into account the time span in which historically – and hence statistically – tidal events took place, the EIS proposes a homogeneous scenario to describe the effects of high waters on commuting times, which appears both methodologically wrong and without any correspondence with reality, because it paradoxically considers pedestrian mobility in Venice in the early morning (when about 50 thousand people are commuting to their workplace, to which 15 thousand students and pupils and thousands of housewives should be added, not to mention tourists) equal to mobility late at night (when people moving in the city are just about a few hundreds).[11]

The calculation of damages from the interruption of business activities during floods was also found faulty, again because overlooking statistical data on the historical frequencies of high waters at different times of the day and their permanence at each tidal level. Furthermore, the working group rejected the assumption that business activities are interrupted if taking place at levels other than ground floors, while the EIS had assumed that if ground floors were flooded by more than 15 cm all activities in a building, even at upper floors, would be interrupted. This was seen, once more, not to correspond to the real experience of the city, much more resilient to episodes of high waters than assumed in the EIS (1997, p. 40/43):

> This assertion is in stark contrast with the real data of concrete experience, which in the conditions indicated in the Study [EIS] is indeed affected by hindrances and delays, but not the suspension of all business activities within flooded buildings.

The same contrast between the assumptions of the EIS and the "real data of concrete experience" was found in the calculations concerning damages to goods stored on ground floors. These, according to the working group, are normally placed at levels higher than +120 or even +130 cm and are moved in case a higher than normal tide is announced.

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city is flooded and the barriers would be operated, while Venice would be dry, underlying sewer ducts would anyway be at least partially flooded and thus damaged.

[11] Such observation concerning mobility at night was later taken into account by the CVN, which revised its estimates accordingly. The revision did not significantly alter the results of the cost-benefit analysis.

According to the Municipality, the EIS was based on abstract assumptions which did not take into account the reality of the city. This was especially claimed for the calculation of the cost of local defences, a set of works which in the meantime had been assigned to the Municipality and its controlled company Insula (1998, p. 30/36):

> The data reproduced in the report [by the five international experts] appear to be entirely overestimated, and the methodology adopted and today explicitly declared (cost of the interventions in some of the more complex and economically expensive "insulae", Saint Mark, Rialto, Tolentini, multiplied by the extension of the areas lying below +120 cm) appears once again rough if compared with the capillary work of real quantification of costs done by Insula SpA and not by Insula only.

The overall evaluation of the economic effects of high waters on the city provided by the EIS was thus summarised (1997, p. 40/43):

> […] the lack of consideration, in the EIS, of statistical data on the hourly distribution of high tides during the day, the use of doubtful basic data, the evident contrast between the hypotheses formulated in the Study and concrete experience, heavily undermine the overall valuation of damages to socio-economic activities: the latter appears more as the result of merely theoretical valuation exercises than the real "picture" of how socio-economic activities take place during tidal events.

The abstract "economic" notion of costs used in the cost-benefit analysis tended to clash with the more concrete accounting of costs offered by the Municipality. Sampling and averaging of costs across the city were rejected in the light of the "differentiated" character of the latter. Models were suspected of reductionism, against evidence of a more complex reality, as experienced through daily maintenance activities. The only stable referent from the perspective of the Municipality was the past: historical frequencies and damages or costs already incurred. The Municipality was claiming a special, local knowledge of the differentiated reality of the city, based on direct experience. It was defending a perspective which could only be held locally, whose truth claims could only apply to a circumscribed place made of actual citizens and their resilience strategies.

The National Commission for EIA

The Commission presented its extensive review of the EIS at the end of 1998. Its 400 pages included a section specifically devoted to the cost-benefit analysis of the mobile barriers. The Commission was very critical of the EIS and unconvinced by the project. The cost-benefit analysis conducted in the EIS was found faulty and criticised on many grounds. The Commission lamented the inaccurate identification and quantification of phenomena and their causes (Ministero dell'Ambiente, 1998, part II.5, p. 162):

> […] the dynamics of high water events, cause-effect linkages and the damages which can be attributed to such events are reconstructed through procedures which entail numerous generalisations [*schematizzazioni*] and simplifications, resulting in approximations not always identified as such nor controllable, which stem from unverifiable assumptions and hypotheses and are prone to incur into

> logical, computational or estimation errors of significant magnitude, at times vital for the reliability of individual estimates.

Such criticism was accompanied by an appeal to the uniqueness and specificity of Venice and its lagoon, irreducible – so the study by the Commission seemed to imply – to standardised approaches to economic calculation (pp. 162-163):

> […] the physical and socio-economic system constituted by the lagoon is unique in its entirety as well as in its individual components, and it is very difficult to simplify it or assimilate it to the environmental and human situations which constitute the object of traditional cost-benefit analyses […].

A special lagoon, the argument was, requires a special calculative effort. A greater scientific attention, according to the Commission, should have been devoted to a deeper study of such allegedly unique phenomena (p. 163):

> […] in order to achieve a sufficient level of reliability for the estimates of the costs caused by high waters it would have been indispensable to undertake a set of investigations, measurements, laboratory and *in situ* tests, significantly deeper and more analytical than those actually conducted […].

The section reviewing the cost-benefit analysis was complemented by a series of critical summaries of the main costs which according to the governmental Commission had been overestimated. Such summaries credited many of the observations made by the Municipality and were seen to "support this judgment of scarce significance of the Cost-Benefit Analysis precisely from a technical and valuation perspective" (p. 164). The conclusion was that (p. 185):

> […] a more detailed reconstruction of phenomena, more careful interpretations or simply more precise measurements and tests of the dynamics and phenomena at play would have led and could lead to very different and even contrasting results […].

What was being objected was not the technique per se, but the way in which it had been applied, seen as inadequate to the unique and differentiated context of Venice and its lagoon. The Commission sought to provide counter-evidence to improve the description of the impact of the mobile barriers on the city's economy. Such counter-evidence was often based on the views of the Municipality and on the more "direct" knowledge of phenomena the latter was claiming to offer. For instance, in relation to disruptions to pedestrian mobility, greater detail was deemed necessary to describe the delays and economic losses suffered by pedestrians and commuters. Knowing the reasons of their movement was considered crucial, as opposed to using the undifferentiated measure of average net hourly income to approximate the economic value of time lost, an approach which had instead been seen by the international experts as "normal in calculations of this type" (p. 185). Because many people, notably tourists, did not

move for work-related reasons, damages were deemed overestimated. This demand for more detailed information was reinforced by appealing to standard and (according to the Commission) widely acceptable procedures for cost-benefit analysis, as long as they espoused greater differentiation (p. 185):

> As normal practice in cost-benefit analysis, it would have been appropriate to reduce the time value for those who commute for reasons other than work, for study, for tourism […] to decreasing fractions of that basic value, which pertains to only some categories of people who are the minority.

Here too, averages were suspected. The calculation of average damages was objected, deemed imprecise and seen not to "correspond to the reality of the city, at least for high waters reaching +100 cm and +120 cm" (p. 190). As for damages to businesses, the evaluation method used in the EIS was considered "acceptable, even though probably overestimated" (p. 190). Overvaluation was explained as likely to derive from overlooking the so-called "passive defence strategies" adopted by businesses located on ground floors (i.e. the cited resilience strategies) or the decrease in activity in many buildings during non-business days and holidays, as well as from the overestimation of the time lost for resuming work on higher floors. Similar observations followed for damages to goods stored in shops and warehouses, hinting once more at the non-standard and differentiated reality of the city.[12]

Analogously, the evaluation of damages caused by floods to embankments was seen as excessively "hypothetical, parametric and unrealistic" (p. 198). The main point contested was the use of average measures for the depth of the lagoon, for water height, and for the energy transmitted to embankments. It was deemed that: "such 'averages' simplify a lagoon reality which is entirely diversified", and that: "The situations considered (and counted up to a measure of 120 Km of embankments) are in fact very diverse in terms of waterfront depths". The Commission additionally noted that: "Not very significant appears the notion of average embankments and other support structures, as their conditions can be quite diversified in terms of type, project size, state of conservation" (p. 199).

On the issue of damages to buildings from salt water aggression, estimates made in the EIS received analogous criticism: "the simplifications proposed by the EIS appear entirely hypothetical and debatable" (p. 203). Even if the CVN had replied to the observations of

[12] For example, it was noted that for many categories of goods, local consumption by residents and tourists did not correspond to local storage. Many residents buy those goods on the mainland, while inventories in the historic centre of Venice are minimised, approximating as far as possible "just in time" deliveries to businesses or even home deliveries to end consumers directly from the mainland distribution and logistic system. Furthermore, the seasonality of consumption patterns in Venice was used as a differentiating element: the high water season (winter months) is the time of the year when tourist expenditure is at its lowest, coinciding with smaller inventories in many shops and activities (p. 194).

Venice Municipality and confirmed the assumptions made in the EIS, the Commission emphasised the uncertainty still characterising the phenomenon. The causes of damages to inner walls (not facing canals) were seen in need of clarification. It was suggested that these may not necessarily be related to floods only. A great part of the restoration works were seen to be anyway needed and thus unavoidable even in case the mobile barriers were built.

Finally, the Commission questioned the data used to calculate the surface of walls at risk of salt aggression. In line with the views of the Municipality, the Commission observed that the costs related to salt aggression – counted in the EIS as benefits of the mobile barriers – had been overestimated at least by an order of magnitude, because most of the maintenance costs would be incurred even in the presence of the mobile barriers. The Commission noted the difficulty to separate the damages produced by "ordinary" tidal dynamics (which would remain even in the case the mobile barriers were built) from the effects of "exceptional" high waters. The inability to grasp this distinction was seen to undermine the current science of the lagoon, no longer able, due to environmental degradation, to distinguish between normal and abnormal phenomena (p. 163):

> […] it is difficult to separate the effects of significant high waters […] from the general effects and damages which characterise the special lagoon environment and its ordinary tidal dynamics more particularly (the effects of "non-high" waters). This is also due to the significant and rapid mutation of many lagoon characters, both in qualitative and quantitative terms, generated in the system by the ecological, morphological and hydrodynamic transformations caused by human interventions, particularly intense in the last few decades (from the 1960s onwards), as opposed to the former conditions of greater stability and thus of certain and traditional knowledge of phenomena.

In many respects, the views of the Municipality and those of the Commission for EIA coincided. However, they were not identical. The Commission was asking for more experimental tests and more differentiated assumptions, to adapt the cost-benefit analysis to the allegedly unique and complex nature of the lagoon of Venice. It was seeking a compromise able to capture local variations and specificity via localised tests and observations without rejecting the possibility to combine and reconcile them into an overall representation of the "unique whole" constituted by the lagoon.

Styles of reasoning and the commensuration of the object of calculation

The controversy presented above unfolded as a disagreement over the acceptable level of abstraction for quantitative representations of the city and the lagoon. In order to calculate overall flood damages, the different traits of the city, of its population and of the lagoon environment had to be made commensurable, aggregated and combined into common measures. At stake was the construction of a unified and systematic vision of the territory, and

thus of a space of quantification where comparisons and equivalences could be established, in order to arrive at an ultimate cost-benefit ratio. But things could not be "made the same". Different quantitative representations emerged, reflecting different ways of conceiving the territory and intervening upon it. In particular, the views summarised above entailed different "styles" of reasoning about the causes of flood damages, i.e. of the phenomena which cost-benefit analysis was set out to capture in economic terms.

These different ways of investigating causes and assumptions about causation, which led to different ways of costing and calculating, could be described along the lines of the following dichotomies: normal vs. exceptional causes, specific vs. general causes, physical vs. historical causes.

Normal vs. exceptional causes

Both the Municipality and the National Commission for EIA suggested that many of the costs avoided by the mobile barriers were in fact non differential, because they were associated with maintenance and repair activities which would have to be undertaken even if the mobile barriers were in place. That is, some causes of damage were seen as "normal" rather than due to exceptional high waters (e.g. damages to buildings from salt aggression and low waters). Whether flood damages were regarded as underestimated or overestimated depended on a certain idea of what is the "normal", inevitable level of damages suffered by a city built on water, and thus what is the normal level of maintenance for the city's infrastructure. Analogously, various resilience strategies were seen by the Municipality as quite normal for a city built on water. They were regarded as ordinary rather than as a disruption whose cost should be eliminated. Once normalised, resilience strategies could be externalised from the calculation.

Thus, the identification of differential costs in the costing of flood damages ultimately rested on a certain notion of normality which would determine what difference the mobile barriers could make for the troubled relationship between the city and waters. In order to agree on which costs were differential and thus relevant, ideas about the normal state of the city would need to be discussed and a boundary between the normal and the exceptional established. Treating resilience strategies as ordinary suggests the acceptance of Venice as a city which, unlike most other cities, can never be entirely "dry": it normalizes the less serious floods as inevitable. Yet such idea of normality was not only and perhaps not so much a technical matter, but a political and cultural one that remained implicit in the calculations conducted.

Specific causes vs. general causes

The possibility of generalising costs and statistical measures across the territory, and thus, to some extent, of standardising it, was questioned. The calculation of damages to the built environment through the progressive "averaging" of localised conditions, the notion of "average embankment", and the derivation of the cost of local defences from the generalisation of individual samples, were seen by the Municipality and the National Commission for EIA as unacceptable approximations. Further differentiation was invoked for the scenarios based on which flood damages were calculated (e.g. seasonality of floods, types of commuters, or other specific characteristics of the city requiring special assumptions to be made in the cost-benefit analysis). Sampling, averaging and commensurating were resisted and a strong concern with the meaning and realism of statistical aggregates was expressed. Both the Municipality and the National Commission suggested that averages were not meaningful because they combined diverse, specific, largely incommensurable phenomena whose causes, the implication was, should be considered one by one, at a more disaggregated level.

This sort of criticism of statistical aggregates is all but new. That things and people can be acted upon and governed on a large scale by virtue of statistical aggregates is often taken for granted. However, the history of statistics shows that this was not always the case. As brilliantly exposed by Desrosières (1998, chapter 3), statistical aggregates, their realism and their meaning, have been the object of fierce disputes. In the development of clinical medicine, for example, whether patients could be "standardised" via statistics was (and still is) highly controversial. Different camps formed. Family doctors tended to see individuals as unique and tended to defend the idea of medicine as an "art" based on subjective experience and tradition. Preventive, collective medicine and hygiene, operating on a much larger scale, were instead ready to embrace the use of statistical data to infer connections between diseases and their cures. They sought to discover the "macro causes" of such diseases by identifying statistical regularities in the population, in order to establish preventive mass interventions via standard treatments. Somewhere in the middle was the position of those who, while accepting the new statistical method, worried about the loss of specificity it implied and sought to combine the use of statistical data with experimentation, in order not to lose track of the "specific causes" of illnesses and to avoid treating patients "on the average". This last group was concerned with the "micro causes" of diseases, to be identified at the level of the individual patient.

In such debates, different degrees of belief in statistical aggregates corresponded to a different scale of the medical interventions sought, as well as to different ways of conceiving the patient. The larger the scale of the intervention sought, the greater the reliance on aggregate measures and the tolerance of the loss of individual specificity. Yet supporters of the idea of medicine as art found it difficult to accept that patients could be commensurated and treated "on average". Their notion of medicine entailed a view of the patient and of the doctor-patient relationship as unique.

Very similar positions were expressed in the controversy over the costing of flood damages in Venice. The same two factors – the type and scale of the interventions and different conceptions of Venice and its lagoon (the "patient") – help to make sense of such positions. In the first place, resistance to aggregation and averaging can be linked to the alternative ways of intervening in the lagoon which the Municipality and the National Commission were prioritising, and to the specific visibility sought in the context of such interventions – the above mentioned diffuse measures and local defences. It may be argued that the capillary works of repair and maintenance of the city the Municipality is largely in charge of are conducive to the consideration of "specific causes" and "differentiated phenomena". Such works do not require a unified theory of what causes flood damages, the identification of a general model of causation. Calculations can remain contingent on the specific part of the city or the lagoon considered. On the other hand, activities oriented not so much towards an ad-hoc and localised work of maintenance and repair, but towards larger scale, preventive measures for flood control, demand to hold together and make commensurable a much wider set of relations. They require a more abstract outlook on the lagoon and a more systematic take on the causes of flood damages, so as to inscribe in a unitary model the disparate facts of the lagoon and make them visible from a centre and amenable to large scale intervention.

Thus, what was supposed to be a neutral representation of costs, benefits and environmental impacts remained closely entangled with the administrative interventions which it was expected to assess. Cost-benefit analysis was never external to the projects it had to account for. The costing of flood damages was enmeshed in the type of interventions sought – costing in different ways meant seeing and thus intervening in different ways (Hopwood, 1992). In this respect, the controversy highlights how representing and intervening are co-developed in a process fraught with contradictions and laborious adjustments (Hacking, 1983). It shows how "modes of representation embody or articulate available ways of organizing and making sense of the world" (Poovey, 1998, p. xv). It illustrates how "the conventions of aggregation,

whose various justifications and supports depend on circumstance, find their meaning within the framework of the practices they account for" (Desrosières, 1998, p. 101).

In the second place, different degrees of reliance on averages and aggregations also expressed alternative ways of conceiving Venice and the lagoon environment. The Municipality focused on today's citizens and their resilience strategies. It offered a vision from the ground, based on its own specific experience of floods. The costing of flood damages was based on direct historical knowledge of the actual city and on the experience of its present inhabitants. Such knowledge was valued and deemed "real" and objective by virtue of its local and unmediated character: it was described as "actual", not "hypothetical"; as descending from experience and tradition, not models. "Real" costs, in this account, were equated with historic costs incurred and recorded locally – the only estimates seen as objective and reliable. The Municipality was claiming the right to represent a setting regarded as specific and highly differentiated, made of unique traits which could not be treated as equivalent so as to derive an ultimate and general description. Its representation of the city remained a set of local descriptions of contingent phenomena, a "view from somewhere" based on direct observation. Such view was seen as more reliable and verifiable than the more abstract modelling offered by the CVN and endorsed by the international experts.

The perspective adopted by the group of international experts was consistent with the stance taken in the EIS. The identification of intangible or social costs was linked to a very abstract notion of stakeholder: future generations, mankind as a whole. The definition of Venice as a common heritage for mankind took the calculation of costs and benefits well beyond the horizon of the city's local administration, into an abstract economic space where notions of costs and benefits are more disengaged from everyday practices of data collection and direct experience of floods. "Objective" costs, in this account, were all possible costs: not only those experienced locally, and not only historic ones; they were "general" costs, systematically investigated with respect to all possible stakeholders. The emphasis of the costing exercise was more on the abstract relevance to a variety of stakeholders, and less on the reliability of primary data. The international experts and the CVN were trying to describe the city "from nowhere".[13] They were offering a stance which had the ambition to be impersonal, independent of the viewer, that could transcend local perspectives to be universally valid and communicable. They assumed the "ethos of the interchangeable and therefore featureless

[13] The expression, borrowed from Nagel (1986), has come to epitomise the universalistic ambition of modern science and its ideals of objectivity, impersonality and truth: of a knowledge independent of the knower (see also: Shapin, 1998).

observer", as Daston puts it, "unmarked by nationality, by sensory dullness or acuity, by training or tradition; by quirky apparatus, by colourful writing style, or by any other idiosyncrasy that might interfere with the communication, comparison and accumulation of results" (1992, p. 599).

The National Commission for EIA occupied a middle ground. While rejecting several generalisations resulting from averaging and aggregation, it also seemed concerned with the need to reconcile local differences and provide a more general description of the lagoon, as long as such a description could accommodate more variation and contingency. But such a general description was not related to any underlying general or "macro" cause, to a unified model of the lagoon; rather, it was seen as the result of a variety of localised, specific, "micro" causes, to be explored one by one via more spatially diversified and localised empirical tests before any commensuration between them was attempted. The Commission seemed to imply a view of the lagoon as a complex and differentiated system shaped by multiple local causes, a "unique whole" which science was asked to analyse through more diversified experiments.

The possibility to achieve a "unified" view of these dispersed phenomena was problematised in the light of their uniqueness and internal differentiation, but not entirely rejected. That is, the Commission seemed to defend a "view from everywhere", in the sense of validating more general representations of the city and the lagoon only by means of the specific and sometimes anecdotal knowledge held locally. Scientific rigour seemed to be related both to the achievement of general results, and to the need to derive those results from the consideration of more local and differentiated sources of evidence which needed to be analysed in their idiosyncrasy before any commensuration and generalisation were attempted. The Commission did not take commensuration for granted, nor rejected it altogether. Rather, it subjected it to the test of local observations and experiments. The lagoon was deemed as irreducible to the sum of its parts, even when such sum was in principle sought.

Both the Municipality and the National Commission for EIA were appealing to a well-established notion of the lagoon, traditionally described as unique and incomparable by the same city council which requested the involvement of "modern environmental economics" in its safeguard (Consiglio Comunale di Venezia, 1985, p. 1/4):

> […] it is necessary to set a monitoring system for the continuous verification of the environmental, hygienic, ecological and hydraulic situation of the lagoon, while considering the lagoon as the *only valid model (of itself)*, on which the evolution of the situation and the consequences of the above mentioned interventions should be experimentally verified. [Emphasis added]

The continuous monitoring of the lagoon of Venice, the direct experiments with its restoration the Municipality was invoking, the qualitative observation of damages caused by flood episodes, the estimation of the costs of local measures from the actual record of costs already incurred, may be regarded as the expression of a specific style of investigating the "true facts" of the lagoon: direct observation and (quantitative or qualitative) descriptions of *a variety which it was not necessary to unify*. In this account, the object of monitoring and experimentation was treated as internally incommensurable, unpredictable and largely opaque. It could be observed and acted upon locally, "from somewhere", but not unified through aggregate measures, not seen from a centre and thus not "actionable at a distance". What is more, "continuous monitoring" would keep the observed phenomena open ended and implicitly accept their on-going evolution – an evolution which defies commensuration. According to this view, the *actual* response of the lagoon to its morphological restoration, once the causes of its degradation are removed, should be observed before designing a flood barrier and assessing its costs and benefits.

Natural vs. historical causes

The "facts" of the lagoon were seen as especially elusive: a **"**benchmark" state for the latter could not be established. Opponents of the mobile barriers assumed that any interventions at the inlets should follow, not precede, the restoration of the lagoon, which should be taken back as far as possible to its pre-industrial conditions. The mobile barriers or analogous solutions would have to be assessed against the background of a restored and de-polluted lagoon, which, although to an uncertain extent, would be able to better resist rising tides.

It has been acknowledged that a "natural" or "pristine" state is impossible to identify for the lagoon of Venice, which has been intensely altered by human interventions, before and after its industrialization. The future evolution of the lagoon and the effects of past human interventions are seen as extremely difficult to distinguish when applying hydrodynamic models (Da Mosto *et al.*, 2005, p. 643). Such separation was however suggested by the Municipality and the National Commission for EIA, to disengage the future of the lagoon from its present degraded condition and to show the latter not as a "fact" based on which flood protection measures could be modelled, but as the inheritance of a past which was being repudiated. Once linked back to wrong past interventions, once given a history, the current morphology of the lagoon was no longer a pure matter of fact which could be modelled and measured. It came to be seen as one of the damages caused by industrialisation, which safeguarding interventions were expected to reverse. It was a "relative", unstable fact: the

consequence of human decisions. That is, "natural" causes and "historical" causes could not be disentangled. The lagoon was portrayed as a complex, "hybrid" environment, on which the scars of history were visible to the eye of "lay" citizens but which remained reluctant modelling. Conceived as a living, on-going experiment, the lagoon could not be turned into a unified object of calculation: it remained an incomplete and unstable "inscription" (Latour, 1987), made of parts which could be continuously observed and recorded but never entirely inscribed in a theoretical model of the whole.

It is not wilderness, but a nature transfigured by an idealised civic tradition which informs the present ideal of sustainability in Venice (Bevilacqua, 1998; Caniato, 2005). The pre-modern "hybrid" constituted by Venetian institutions and their hydraulic science and water policies is still a powerful myth. Studies of the traditional practices of water management adopted by the Republic of Venice tend to reinforce the idea of the lagoon as a continuous and prudent experiment – hence the aforementioned requirements of gradual, flexible and reversible flood protection measures. Such studies recall how water policies were developed by the so-called "savi alle acque" (water experts) based on the direct local observations provided by "lay" citizens such as fishermen (Bevilacqua, 1998; Zucchetta, 2000). What is today described as the prudent experimental attitude of the past, based on direct local observation, is often evoked by opponents of the mobile barrier project and contrasted with the drastic changes imposed on the lagoon by its nationally funded industrialisation. The lagoon of the past appears to many as a more stable reference point than any present, a-historical, "hard" facts, which in such an altered environment end up being constantly confused with modernist mistakes and lose their "purity". The problem of saving Venice continuously shifted from the realm of science to that of a hybrid and perhaps mythical science-policy, to the enlightened polis which lives at once in the memory of the Republic of Venice and in the promise of a more sustainable future.

Comparing the mobile barriers with diffuse interventions for environmental restoration, making the two alternatives commensurable by means of cost-benefit calculations, ultimately implied the need to choose between today's lagoon, for which the mobile barriers were being designed, and yesterday's lagoon, an ideal which some consider lost for ever, but which many refuse to let go. Declaring the lagoon as incommensurable, as "the only model of itself" implied the refusal to treat its present condition as the benchmark which the mobile barriers should be based on; it was the defence of a highly symbolic place (a specific "somewhere",

with its history and human responsibilities), against the creation of an abstract space of calculation where past human responsibilities would be disguised as natural facts.

Styles of calculation

Struggles about how to measure and account for flood damages were also conflicts over how to avoid those damages via different types of interventions. Representation and intervention were inextricably linked. However, they were not recognised and debated as such. The fiction of their separation was largely maintained. The assumptions of calculation were never openly negotiated; they were, at best, identified at times, but only to be fingered as wrong or implicitly accused of bias. Different arguments may have been used strategically, as "ammunition machines" (Burchell *et al.*, 1980) to promote one solution at the expense of another and one set of interests at the expense of another. But different actors were convinced to be right. They mobilised and expressed different ways of making sense of the causes of floods and their costs, as well as different ways of seeing and knowing Venice and its lagoon.

The different views which emerged in the course of the controversy can be shown to contain at least "traces" of different styles of reasoning. As mentioned above, through the notion of "style" Hacking intends to question the conditions for the emergence of different ways of knowing and for the establishment of certain bodies of knowledge. Styles of reasoning are defined as that which determines the types of propositions that become candidates for being true or false and come to define certain fields of inquiry; they explain why we reason as we do. Styles are different from methods: they are not the criteria through which truth values are *assigned*, but through which certain truth values, certain "positivities", *become possible* at all. And neither do styles coincide with "logics": the latter are ways of maintaining the truth, whereas the former are "what brings in the possibility of truth and falsehood" (2002, p. 167). Thus, while a style may encompass certain methods and logics, it is seen by Hacking as something larger, as that which makes it possible for certain logics and methods to emerge in the first place. Furthermore, specific methods, logics and truth values are seen as self-stabilising mechanisms within the style they belong to: a style of reasoning is akin to a discourse that has developed its own techniques of self-authentication.

The criteria offered by Hacking for the identification of styles of reasoning have been seen as rather difficult to apply (Kusch, 2010). Following Hacking, a style would have to be identified via the specific "objects, evidence, sentences […] laws, or, at any rate modalities, possibilities" (Hacking, 2002, p. 189) it generates. Examples of styles provided by Hacking (2002, p. 161 and p. 181) based on the work of historian Alistair C. Crombie include:

postulation in mathematics, experimental exploration, hypothetical construction of analogical models, comparison and taxonomy, statistical analysis and calculus of probabilities. To Crombie's list Hacking adds the so-called "laboratory style" seen as the fusion of the experimental style and the modelling style (pp. 182-183).

The conflicting views which emerged in the Venice case tended to endorse different styles in Crombie's list: modelling in the case of the "view from nowhere" taken by the CVN and international experts as opposed to direct experimentation on the lagoon, seen as "the only model of itself", in the case of the Municipality and its "view from somewhere". Direct experimentation was also partly endorsed by the National Commission for EIA, whose "view from everywhere" required local experiments and tests before any unified model of the lagoon could be attempted or validated.

Furthermore, numbers and statistics were mobilised within different forms of representation which, as shown above, embraced different notions of causation linked to different ways of conceiving and intervening upon Venice and its lagoon. Like Hacking's styles, different views introduced different modalities and possibilities for intervention at the expense of others. The "view from somewhere", consisting of local observations, past experience and *in vivo* experimentation, was consistent with projects like diffuse measures and local defences, but was hardly able to provide the more systematic and unified outlook on the lagoon required by the flood barrier. Conversely, the "view from nowhere" appeared inaccurate and abstract to those interested in local and capillary maintenance and restoration works.

These views also implied different understandings of realism and objectivity and mobilised different epistemic values. Strategic as it may have been, the dispute over flood damages and their under- or over-estimation nonetheless went to the heart of the definition of objectivity. The preoccupation with the realism of aggregates and averages expressed by the Municipality and by the National Commission for EIA tended to endorse a notion of objectivity as data accuracy, as correspondence between numbers and the underlying physical and economic reality. As a result, the "view from somewhere" and the "view from everywhere" valued historical frequencies, historic costs and raw local data, whilst distrusting probabilistic models, costs to future generations and sampling. Notions like "average embankment" were rejected as meaningless in the context of the internally differentiated and unique environment represented by Venice and its lagoon, treated as only partly commensurable. The "view from nowhere" was instead trying to establish a systematic outlook on flood damages, a general and coherent description of their causes and the consideration of all possible stakeholders. It

valued systematicity over accuracy. These two extremes express different degrees of acceptance of distance and abstraction in the economic representation of the territory. The "view from somewhere" and the "view from everywhere" required a tight fit between recording and observation, and thus credited primary data. They explicitly offered a view of the lagoon as an unmediated object of investigation, as an *in vivo* experiment. In doing so, they also implicitly credited the eye of the local observer, whose virtue lay precisely in the unmediated character of its vision. In contrast, the "view from nowhere" relied, like most contemporary economics (Morgan, 2011), on the mediation offered by records often produced or interpreted at a distance from observation, such as statistical aggregates. Its aim was not so much to provide an accurate description of the parts, but a theory of the whole.[14] Thus, it was more tolerant of the loss of accuracy implied by the need to make dispersed local data fit a theory of the whole via averages and aggregations. The eye of the observer was legitimate in that its vision was systematic, complete and perceived as independent of the standpoint taken.

Different attitudes towards the realism of aggregates and averages reflect what Schweber (2006), borrowing from Hacking, calls different styles of statistical reasoning. With the notion of style Schweber denotes the different types of explanation which statistics has historically pursued in different national contexts. She shows that French population statistics in the nineteenth century developed a constant preoccupation with homogeneity and aggregation. According to Schweber, such preoccupation resulted from a view of state and society as conflicting and separate spheres, and expressed a constant concern with the conditions under which unity could be achieved. In this context, statistical aggregates and the natural and social regularities that they could in principle reveal were symbolic of the unity of the state. They were in question because the latter also was. Statistics was involved in the process of "adunation" of a political entity that needed unifying (Desrosières, 1998).[15] Along similar lines, it may be argued that in the case of Venice aggregates were contested because they established a view from a centre that was also contested, conceived as separate from the

[14] This tension between accuracy and systematicity, between raw but dispersed local data – valued precisely because deemed "pure" and value-free – and systematised data – elaborated within a certain theory in order to acquire explanatory power – according to Poovey (1998), is an unresolved tension in the history of the modern fact and remains the source of most contemporary disputes over objectivity and the relationship between facts and values.

[15] Conversely, in England atomistic and probabilistic constructions of the population corresponded to an anti-statist discourse that located sovereignty at the level of the individual and that relied on a consensual model of government. Whether the aggregates of population statistics were "real" or not was a non-issue in England. Here the attitude towards statistics was more pragmatic, oriented towards making numbers useful for practical purposes. Statistics was seeking to make the population amenable to intervention, and aggregate representations of the latter were not associated with any strong political symbolism. Within such context, numbers had more an instrumental than symbolic role, they were primarily tools of intervention (Schweber, 2006).

territory that cost-benefit analysis was seeking to capture in economic terms. The standardisation of the object of calculation – Venice and its lagoon – via aggregates, averages and common measures remained problematic because the subject of the calculation – the state – was perceived as divided and conflict-ridden and, as the next section illustrates, it was a specific approach to its "unification" that was at play in the appraisal process.

Standardising the subject of calculation

The mobile barrier project is currently under construction and deemed to be 65% complete. Works are expected to be completed by 2014.[16] The barrier remains, however, highly controversial. Due to subsequent alterations and integrations to the original project, its costs have risen from just under 4 billion Euro (as estimated in 2001) to 5.5 billion Euro. The Municipality of Venice and environmental groups continue to fiercely oppose it. In 2005 the Municipality invited proposals for alternative flood gate solutions. Nine submissions were examined, ranked and compared with the mobile barriers (Comune di Venezia, 2006). The mobile barriers were ranked fourth out of the five short-listed projects, which, however, were never considered by the national government. Furthermore, in 2009 a study commissioned by the Municipality in order to address concerns with the hydrodynamic behaviour of the mobile barrier system suggested the possible instability of the flood gates under certain conditions (Berhault & Damblans, 2009). More generally, a wealth of materials and studies have appeared in the last decade, questioning, *inter alia*, the adequacy of the project to future sea level rise and its impacts on the lagoon environment (Pirazzoli & Umgiesser, 2003, 2006; D'Alpaos, 2010).

In the midst of this endless controversy, the question of whether the benefits of mobile barriers were greater than their costs, whether the project was economically and environmentally rational and useful, did not receive a final, agreed answer, despite recent academic attempts to contribute to the debate (Breil *et al.*, 2005; Fontini *et al.*, 2008; Vergano *et al.*, 2010). Alternative economic representations have not been reconciled in the pursuit of an ultimate conclusion that could be regarded as "objective". Rather than achieving standardisation and being presented as impersonal, calculations confirmed political divisions. The result of cost-benefit analysis remained less important than the differences it elicited and helped to articulate.

[16] Official data provided by the CVN in December 2011. Periodic updates are available at www.salve.it.

Were the differences in the styles of calculation at play too radical to be reconciled? The lack of any attempts to discuss and reconcile them shows that the appetite for standardisation and the very conditions for the pursuit of "mechanical objectivity" and the emergence of "trust in numbers" (Porter, 1995b) remained, in this specific institutional context, rather weak. Porter's work suggests that objectivity and standardisation are demanded in the presence of external pressures and mistrust in technical elites, when authority is weak, institutions are fragmented and disciplinary boundaries permeable (Porter, 1992, 1995b; see also: Espeland & Stevens, 1998; Fligstein, 1998). In these circumstances, subjective professional judgement and bureaucratic discretion become difficult to defend and the alleged impersonality of numbers turns out to be more appealing. Institutional diversity and fragmentation, in situations where decisions must be presented as collective and democratic, call for quantification even if the latter comes at the cost of simplification and loss of accuracy (Daston, 1995; Rottenburg, 2009, p. 190).

The institutional context analysed here shares many of these characteristics, but crucial differences remain. As mentioned above, the request to subject the project to an environmental and economic appraisal was accompanied by distrust in the CVN and the Water Magistrate and by the preoccupation to subject decisions to greater "technical and scientific control". The promoters of the mobile barriers saw their discretion challenged and contested. Furthermore, the appraisal of the project was conducted in the context of a complex division of labour between levels of government, and through the contribution of several disciplines represented in a variety of groups and commissions.[17] In such circumstances, with no single group of experts able to claim full authority over the problems at stake, where distrust in bureaucratic discretion was widespread, an appetite for impersonality and "mechanical objectivity" (Porter, 1995b), a need to back up individual positions with explicit, impersonal and replicable decision criteria, could be expected.

However, such appetite was combined with an opposite one, and ultimately counteracted by it. Behind the request to involve international experts lay not so much an aspiration towards *impersonality* – understood as "a view from nowhere", a knowledge independent of the

[17] All the groups involved in the appraisal were, to some extent, inter-disciplinary. The working group of Venice Municipality, whose composition changed several times, included engineers as well as experts of environmental legislation, ecology, soil defence, geotechnics. The cost-benefit analysis in the EIS was conducted primarily by engineers. The disciplines represented in the group of international experts included hydrodynamics, environmental economics, flood risk management, ecology, environmental science and climate change. Members of the national commission for EIA were all experts of environmental appraisals, but with different educational backgrounds, from planning and architecture to biology and law.

subject – but rather towards *impartiality* – "a view from somewhere else", from an external arbiter in an open dispute. As mentioned, the Municipality had invoked the involvement of "international institutions best able to guarantee impartial work" (Consiglio Comunale di Venezia, 1995a: 8-9/10). Fear of vested interests and the desire to open up the decision to public scrutiny mobilised not so much an ideal of impersonality, but one of impartiality.[18] It was not enough to involve a certain type of expertise in order to guide conflict resolution, it was not simply a matter of taming politics with science. Expertise was to be international: to be credible, it had to transcend the state. Its legitimacy derived less from its scientific standing than from its being, symbolically at least, external to the state and its internal divisions. The appraisal of the project was configured from the start as an arbitration on a dispute between conflicting subjects within a divided state. It was the international origin of the subject of the calculation that ultimately mattered, not so much its attempted erasure via numbers and standard decision rules.

Paradoxically, while the panel of international experts sought indeed to provide an impersonal stance, a "view from nowhere", the very act of their involvement defeated the standardisation of the subject and the pursuit of mechanical objectivity. Precisely because the subject, the national decision maker, was seen as problematic, as too politicised and divided, as something to be transcended, it remained vividly in the background as something to be reformed by an alternative authority coming from somewhere else. But even the international experts ended up being perceived as one more subject in the dispute, and while deemed by many as more credible than national experts, they could not bring mechanical objectivity. Cost-benefit calculations could not be reconciled because from the start the subject of calculation was conceived as fragmented and polycentric, and calculation was mobilised not so much to "erase" it, but to adjudicate the controversy to one of the actors involved via a process of international arbitration. Calculation was enrolled within a political ethos which on the surface aspired to achieve a "view from nowhere", but deep down seemed to accept that all views are ultimately from somewhere and that in order to be credible cost-benefit analysis had to be validated by experts coming from "elsewhere", external to what were seen as politically

[18] Impersonal: "Not pertaining to or connected with any particular person or persons; having no personal reference or connection". Impartial: "not partial; not favouring one party or side more than another; unprejudiced, unbiased, fair, just, equitable" (Oxford English Dictionary, 2000). The notion of impersonality, as used in the philosophy and sociology of science (Nagel, 1986; Daston, 1992; Shapin, 1998), refers to the ambition to separate knowledge and knower, to achieve a "depersonalised" and objective knowledge, independent of its subject. The notion of impartiality has a rather different connotation: it points to a fair, unbiased, just, unprejudiced, independent, disinterested subject, such as an arbiter or judge in a dispute, but not to the complete erasure of the subject.

saturated national boundaries.[19] Confronted with fear of bias, vested interests and arbitrariness, this specific institutional environment did not react by replacing trust in experts with trust in numbers. It did not rationalise the state via the establishment of impersonal knowledge; rather, it credited expertise only if it transcended the state whose institutions were in question by enrolling an international arbiter.

This further explains why statistical aggregates were so problematic, why processes of aggregation could not be taken for granted and were immediately fingered as debatable commensurations of too disparate entities. Commensurating different parts of the territory via averages and aggregations in order to make the latter amenable to large scale intervention establishes a view from the centre, it presupposes the existence of *a centre that sees itself as such*. Only then can the various parts of the territory and the population combined under its gaze in the act of aggregation be recognised as belonging to the same entity. Only then can "action at a distance" succeed. If such centre is contested, if more than one centre exists, if the territory is disputed and, crucially, if the decision maker posits the existence of an alternative authority to its own, then commensuration will inevitably be highly symbolic of such political divisions; it will appear as unnatural and stir all sorts of preoccupations.

In the appraisal studied here the utilitarian spirit of cost-benefit analysis was defeated. The question of identifying the best, most rational flood protection scheme was superseded by the problem of the coexistence of different political centres. The problem of maximising benefit/cost ratios and of optimising efficiency and effectiveness retreated back into the problem of composing the internal administrative conflict by means of an international arbiter. The ideal of the "rational actor" who can select the optimal solution was dissolved in a polycentric political subject whose problem was not so much optimal choice, but coexistence and internal articulation.

The depersonalisation of the decision making subject by means of cost-benefit analysis was not achieved. The attempt to democratise the decision making process took the contours of a "diplomatic" issue (seeking allies or arbiters beyond the state) rather than of a "policy" issue (establishing the optimal solution). Expertise was never seen nor invoked as truly separate from its subject, as truly impersonal. Impartiality remained more important than impersonality. Commensuration and standardisation were superseded by arbitration and

[19] Appeals to international organisations as a way to overcome internal political conflict and bureaucratic fragmentation have appeared on other occasions in the history of the safeguard of Venice (see: Montanelli, 1969; Senato della Repubblica, 1972, speech by Lanfrè; Italia Nostra, 2011).

adjudication. They could not be institutionalised, as in their background persisted the idea of a flawed and fragmented political subject to be transcended, to be reformed from the outside rather than rationalised from within.

Conclusions

This study shows that commensuration is not simply something that may be achieved or lost, furthered or resisted. If commensuration is ubiquitous (Espeland & Stevens, 1998), it is not an invariant and monolithic phenomenon. Building upon the work of Espeland and Stevens (see also Huault & Rainelli-Weiss, 2011), a more systematic investigation of different modes of commensuration, and the different calculative tools and programmatic ambitions which may sustain them, can be envisaged. The cost-benefit analysis studied here took place against the background of a discourse of uniqueness and specificity (the lagoon as "the only model of itself") which opposed an abstract space of calculation to a specific place which could only be described and calculated locally. In so doing, such discourse limited commensuration but also promoted different degrees of it. Different conceptions of the object of calculation – Venice and its lagoon – corresponded to different approaches to the costing of flood damages.

Furthermore, the commensuration of the different traits of Venice and its lagoon remained limited because of a specific way of conceiving its subject, the decision maker. Commensuration requires a standardising subject, a centre of calculation that conceives itself as such, where records can be collected and compared and categories of equivalence developed (Latour, 1987). When multiple centres of calculation exist, objectivity becomes problematic and attempts to "escape from perspective" are likely to appear. As this study shows, whether calculation succeeds in overcoming conflicting modes of valuing and thus in standardising the subject of calculation by giving it the stamp of impersonality, whether it enables attempts to escape from perspective and to "objectify" the world, crucially, also depends on how its subject is conceived.

A variety of state configurations and programmes, as well as perceptions of the political subject, can help explain the different development of national accounting and statistics in different institutional contexts (Miller, 1990; Patriarca, 1996; Schweber, 2006). Analogously, in the case analysed here, behind the enrolment of cost-benefit analysis lay a specific self-representation of the state as a fragmented and polycentric entity in need to be reformed from the outside via an international arbiter. This problematisation of the decision maker institutionalised the very divisions which calculation should in principle have overcome.

Thus, this case study alerts us to the fact that in order to understand the objectifying potential of economic calculation and its ability to enable "action at a distance", attention must be devoted to the real and imagined subjects that remain in its background. Even at a time when quantitative decision rules are increasingly global standards, or when financial accounting is increasingly "without a state" (Power, 2009), ways of imagining the collective are still powerful means of articulating the possibilities for economic calculation. While standard setting in accounting appears to be increasingly done in the name of an abstract, delocalised and mythical individual "user", discursively constructed through the categories of financial economics (Young, 2006), such rational and responsible individual, the hero of neoliberal governance, is perhaps a less ubiquitous ideal than it might be assumed. In the case considered here, cost-benefit analysis was not conducted in the name of this myth, to foster an ideal of instrumental rationality, but to adjudicate on a conflict within a divided collective actor whose very multiplicity and articulations were paradoxically reinforced, not erased, by calculation.

As Daston and Galison point out, objectivity is to be studied as an ever-evolving aspiration. The separation between knower and knowledge which has come to epitomise modernity is an erratic process constantly underway, which sees "new selves and epistemic virtues, new ways of being and ways of knowing, appear at irregular intervals" (2007, p. 375). In order to understand the role of accounting and economic calculation as one of the principal means through which objectivity, commensuration and standardisation are pursued, this variety of "selves" and "epistemic virtues" has to be addressed.

Ways of counting and accounting, no matter how universalistic their ambitions or globalising the discourses that sustain them, become variously emplaced and displaced. Such emplacements and displacements need to be considered in order to appreciate the variety of modes in which accounting can create "calculating selves and calculable spaces" (Miller, 1992). If calculation implies "a change of values – a move away from the personal, and a vast expansion of the public domain" (Porter, 1995a, p. 83), the way in which the public domain is imagined and defined cannot be taken for granted; rather, it should be investigated as one of the conditions of possibility for the rise and spread of economic calculation.

Appendix: organisations involved in the safeguard of Venice

Committee for Policy Coordination and Control

[Comitato di Indirizzo Coordinamento e Controllo]

Created by the second special law for Venice in 1984, it is responsible for the strategy, coordination, budgeting and monitoring of all safeguard initiatives in Venice and its lagoon. It is chaired by the Prime Minister and includes five Ministers (Cultural Heritage, Environment, Public Works and Infrastructure, University and Scientific Research, Transportation), the president of the Water Magistrate, the Mayors of Venice and Chioggia, two representatives from other local authorities in the lagoon area, and the president of the Veneto Region.

Water Magistrate

[Magistrato alle Acque] www.magisacque.it

The Magistrate is a technical agency of the Ministry for Public Works and Infrastructure in charge of the hydraulic management of a great part of the North-East of Italy. It operates in the Venice Lagoon mainly through its concessionaire Consorzio Venezia Nuova, but it directly manages a limited set of services such as those related to the reduction of pollution and contamination from the industrial area within the Venice lagoon.

Consortium for a New Venice

[Consorzio Venezia Nuova - CVN] www.salve.it

Founded in 1982, the Consortium is the "concessionaire" of the Ministry of Public Works and Infrastructure and of its local branch the Water Magistrate. It is responsible for implementing all the measures to safeguard Venice and its lagoon falling under the remit of the national government. It consists of a group of public and private companies and consortia. In 1995 such concession was formally invalidated with law 206/1995, but all contractual arrangements and the legal effects preceding the passing of this law were maintained valid. That is, plans, projects and works already approved by the Water Magistrate before 1995 will remain under the operational responsibility of the CVN until completion. The monopolistic position of the CVN has been the object of an appeal to the European Commission for infringement of European competition rules. In 2002, a compromise was found between such rules and the role of the CVN, in that the Water Magistrate must now subject new projects to public tendering. Pre-existing ones, like the mobile barriers, remain under its control.

Venice Municipality

[Comune di Venezia] www.comune.venezia.it

The first special law (1973) made the Municipality responsible for the restoration of the urban fabric, including the provision and maintenance of public infrastructure and canals (the secondary network not managed by the Water Magistrate). These duties are now undertaken through Insula Spa.

Insula Spa

www.insula.it

Insula Spa is a public limited company owned by the Municipality (72%), the Regional government of Veneto (1%) and Veritas Spa (27%) (www.gruppoveritas.it), a local, publicly owned, multi-utility company. It was originally established as a mixed public-private company in 1997, and became entirely publicly owned in 2007. It plans, tenders and coordinates works and services relating to the maintenance of canals, bridges, façades and

foundations of buildings facing canals, pavements, embankments and, in short, of the entire urban fabric.

Panel of five international experts

The panel was appointed with the Decree of the President of the Council of Ministers of 1 February 1996 (modified by subsequent Decrees of 10 July 1997 and 27 September 1997). It comprised of the following members: Prof. Philippe Bourdeau (coordinator) IGEAT, Université Libre de Bruxelles, Bruxelles (Belgium); Prof. Jean-Marie Martin, Environment Institute, Joint Research Centre, European Commission, Ispra, Italy; Prof. Chiang C. Mei, Massachusetts Institute of Technology, Cambridge: MA, USA; Prof. Ignazio Musu, Facoltà di Economia, Università Ca' Foscari di Venezia, Italy; Prof. Pier Vellinga, Institute for Environmental Studies, Vrije Universiteit Amsterdam, The Netherlands.

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